Modular Assays for Solar System Exploration (MASSE). An Overview on behalf of the MASSE team.

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The concept of the Modular Assays for Solar System Exploration (MASSE) was born in 1998, out of research conducted on ALH84001 to understand the nature of terrestrial organisms inhabiting the meteorite. These had not been detected during several organic analysis conducted. Therefore, a modular assay using sensitive biotechnology techniques was initiated and initially funded by NASA and recommended for development for the defunct 2005 ESA mission to Mars.

The MASSE team is a multinational entity spread across 15 institutions (including NASA MSFC, CIW, MBL), containing ~30 people and several companies (Charles River, Caliper, Affymetrix, Jacobs Sverdrup, British Aerospace). We are in the middle of conducting proof of concept studies on DNA and antibody microarrays, enzyme assays including LAL and ATP and PCR amplification in field, laboratory and simulated space environments (to verify robustness). Thus far nothing has led us to believe that this technology cannot be used for the applications mentioned. Microfluidic, MEMs and micro-optics systems have been, or are being incorporated into a miniaturized instruments capable of undertaking any of these analysis for life detection and characterization, environmental monitoring on earth and in space habitats and astronaut health monitoring applications.

Since 1998 several competing instruments to MASSE are now being proposed for space exploration, exemplified by the combination of teams working on the ESA life marker chip instrument for the 2009 Exomars mission. It shows that this concept is robust and exciting and that development of this technology is paramount for both life detection and many other exploration applications.